

**Supplemental Specification
2005 Standard Specification Book**

SECTION 02785

CHIP SEAL COAT

Delete Section 02785 in its entirety and replace with the following:

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Materials and procedures for applying emulsified asphalt, followed with an application of cover material and bituminous flush coat.
- B. Cover materials.

1.2 RELATED SECTIONS

- A. Section 01554: Traffic Control
- B. Section 01558: Temporary Pavement Markings
- C. Section 02742S: Project Specific Surfacing Requirements
- D. Section 02745: Asphalt Material
- E. Section 02748: Prime Coat/Tack Coat

1.3 REFERENCES

- A. AASHTO T 11: Materials Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing
- B. AASHTO T 19: Unit Weight and Voids in Aggregate
- C. AASHTO T 27: Sieve Analysis of Fine and Coarse Aggregates
- D. AASHTO T 59: Standard Test Methods for Emulsified Asphalts

- E. AASHTO T 96: Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
- F. AASHTO T 104: Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- G. AASHTO T 278: Surface Frictional Properties Using the British Pendulum Tester
- H. AASHTO T 279: Accelerated Polishing of Aggregates Using the British Wheel
- I. AASHTO TP 61: Determining the Percentage of Fractured Particles in Coarse Aggregate
- J. UDOT Materials Manual of Instruction
- K. UDOT Minimum Sampling and Testing Requirements
- L. UDOT Quality Management Plan

1.4 SUBMITTALS

- A. Mineral Aggregate
 - 1. Test Reports
 - a. Cover Material meets requirements of this Section, article 2.4.
- B. Verification that asphalt/polymer emulsion meets Section 02745
- C. Verification that asphalt/polymer supplier adheres to UDOT Quality Management Plan for Asphalt Emulsion 508.
- D. Submit all documentation verifying asphalt application rates, chip application, and other calibration verification for applied materials during the chip seal operations to the Engineer on a daily basis, or as requested by the Engineer.
- E. Provide vendor's bill of lading certifying the material was diluted in accordance with this Section, article 2.3.

1.5 ACCEPTANCE

- A. Acceptance sampling and testing of material is in accordance with UDOT Minimum Sampling and Testing Requirements.
- B. Price Adjustments – Cover Material Gradation
 - 1. Based on the number of samples per lot and the minimum pay factor.

2. Pay Factors for aggregate gradation when tested in accordance with AASHTO T 27 and AASHTO T 11 are indicated in Table 1.

Table 1 Aggregate Gradation Pay Factors			
Sieve Size	Pay Factor*	Type I Acceptance Band**	Type II Acceptance Band**
1/2 inch	1.00 0.95 0.90 0.85 Reject		100.0 99.0 98.0 97.0 < 97.0
3/8 inch	1.00 0.95 0.90 0.85 Reject	100.0 99.0 98.0 97.0 < 97.0	70.0 - 90.0 69.5 - 91.5 69.2 - 92.0 68.0 - 92.0 < 68.0 and > 92.0
No. 4	1.00 0.95 0.90 0.85 Reject	0 - 15 15.1 - 16.0 16.1 - 17.0 17.1 - 18.0 > 18.0	0 - 10.0 10.1 - 10.5 10.6 - 11.0 11.1 - 12.0 > 12.0
No. 8	1.00 0.95 0.90 0.85 Reject		0.0 - 5.0 5.1 - 5.5 5.6 - 6.0 6.1 - 7.0 > 7.0
No. 200	1.00 0.75 0.50 Reject	0.0 - 1.0 1.1 - 1.5 1.6 - 2.0 > 2.0	0.0 - 1.0 1.1 - 1.5 1.6 - 2.0 > 2.0

* Use the lowest individual pay factor for combined gradation

** Average of tests

PART 2 PRODUCTS

2.1 CATIONIC EMULSIONS

- A. CRS-2A per Section 02745.
- B. CRS-2P per Section 02745.
- C. LMCRS-2 per Section 02745.

2.2 HIGH FLOAT EMULSIONS

- A. HFRS-2P per Section 02745.
- B. HFMS-2 per Section 02745.
- C. HFMS-2P per Section 02745.

2.3 FLUSH COAT

- A. Use the emulsion as designated in Special Provision 02742S, diluted two parts concentrate to one part water by the Manufacturer.

2.4 COVER MATERIAL

- A. Use crusher processed virgin aggregate consisting of natural stone, gravel, or slag meeting the requirements of Table 2.

Table 2

Chip Seal Cover Material Properties		
Unit Weight, see Note 1	AASHTO T 19	100 lb/ft ³ , max
One Fractured Face	AASHTO TP 61	95% min.
Two Fractured Faces	AASHTO TP 61	90% min.
LA wear, see Note 1	AASHTO T 96	30% max.
Soundness	AASHTO T 104	10% max.
Flakiness Index	Material MOI 8-933	17 max.
Stripping, see Note 1	Materials MOI 8-945	10% max.
Polishing, see Note 1 (Performed on aggregate prior to crushing)	AASHTO T 278, T 279	31 min.
Field Coating of Emulsified Asphalt (using project specified emulsion)	AASHTO T 59	Rating of "Good"
Note 1: The Department has the right to waive this requirement if the aggregates have proven acceptable through successful past performance as determined by the Engineer.		

- B. Grade with the following limits to meet the specified test standard in AASHTO T 27 and T 11.

Table 3

Gradation Limits		
Sieve Size	Percent Passing	
	Type I	Type II
1/2 in		100
3/8 in		70-90
No. 4	100	0-10
No. 8	0 –15	0-5
No. 200	0 - 1	0-1

2.5 BLOTTER MATERIAL

- A. Refer to Section 02748.

2.6 TEMPORARY PAVEMENT MARKERS

- A. Refer to Section 01558.

2.7 EQUIPMENT

- A. Use distributor trucks meeting the following requirements:
1. Tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of the tank contents.
 2. Insulated tanks capable of storing the binder at temperatures which allow the binder to remain consistent with the appropriate viscosity for proper application rates.
 - a. Use tanks equipped with baffles to prevent pressure surges resulting from the asphalt sloshing in the tank when starting and stopping.
 - b. Use trucks equipped with devices to provide for accurate and rapid correlation and control of the amount of bituminous material being applied, with that of the truck or distributor gauges.
 3. Constant volume circulation pumps and heaters to maintain a pressurized system so binder will be uniformly heated.
 - a. Circulation pump must spray a constant volume for the entire length of the spray bar for each application.
 4. Spray bar and nozzles designed to provide an appropriate fan width to provide uniform transverse distribution, without corrugation or streaking.
 - a. Adjust the spray bar height to provide uniform distribution of binder across the application width and triple lapping of the binder on the pavement surface.
 - b. Use a fully circulating spray bar with a positive shutoff valve.

5. Computerized rate control system allowing the operator to control all distributor operations from the cab to include:
 - a. Regulation of the pressure of the material application and automatic adjustment of rate control to the unit ground speed.
 - 1) Hydrostatic system capable of maintaining a tolerance of ± 0.3 gal/yd².
 - b. Adjustment of the spray bar height and width and shut off of individual spray bar sections.
- B. Use a self-propelled aggregate (chip) spreader specifically designed and manufactured for chip seal operations, equipped with the following:
 1. Computerized controls which will apply a uniform, even layer of aggregate across the full width of the binder, and adjust output to the unit ground speed.
 - a. Use gates adjustable to drop the correct amount of aggregate, plus or minus 1 lb/yd².
 2. Variable width spreader with hydraulic control extension and adjustable discharge gates
 3. Spreading hopper with a minimum capacity to cover a full lane of travel, plus 1 ft/pass.
 4. Spinner broadcast type of aggregate spreader not allowed.
- C. Use sufficient number of dump trucks to circumvent any interruption in the supply of chips to the spreader.
 1. Use tandem axle dump trucks or larger, or conveyor discharge trucks, to minimize the number of hook-ups.
 2. Use dump trucks with matching hitches and compatible with the aggregate spreader to provide smooth hook-ups and to minimize any spillage when loading the hopper
 3. Use trucks in good mechanical condition and that do not leak.
 - a. Use truck tires that do not pick up binder or aggregate when driving on the new surface.
- D. Use a minimum of three articulating type pneumatic rollers for rolling operations.
 1. Use rollers weighing between 8 tons minimum and 12 tons maximum with a minimum width of 6 ft.
 2. Use rollers with pneumatic tires of equal size diameter and having treads satisfactory to the Engineer.
 3. Inflate tires so that the entire roller width area is compacted by either the rear-axle tires or the front-axle tires.
 - a. Inflate tires to 90 lb/in², or lower as approved by the Engineer.
 - 1) Maintain tire pressure within 5 lb/in².

- E. Sweeping equipment
 - 1. Use rotary brooms with nylon or steel bristles or, pickup or vacuum brooms for pavement cleaning or brooming operations.
 - a. Keep downward pressure to a minimum
 - b. Use water as requested by the Engineer if excessive dust is generated during sweeping operations.
 - c. Use pickup or vacuum sweepers in urban areas where aggregate accumulates in gutters or where removal is required from the edge of the shoulder.
 - d. Do not dislodge embedded aggregate when brooming chip sealed roadway.
- F. Blotter Material Equipment
 - 1. Apply blotter material by means of a truck mounted spinner broadcast spreader or other equipment as approved by the Engineer.
- G. All equipment is subject to inspection and approval by the Engineer.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean the road surface of all dirt, sand, dust, and other objectionable material to the satisfaction of the Engineer.
- B. Protect all structures, including guardrail, guideposts, concrete barriers, parapet walls, etc.
- C. Cover manholes, valve boxes, drop inlets and other service utility entrances before placing any chip seal coat.
- D. Stockpile blotter material, a minimum of 0.25 lb/yd² meeting the requirements of Section 02748 at a site within twenty minutes delivery time of each road section being chip sealed, and have on site application equipment before beginning chip seal work.
 - 1. Upon Engineer approval, stockpiling of blotter material may be waived if blotter material can be obtained and ready to spread within twenty minutes of a road section being chip sealed.
 - 2. Equipment to spread blotter material is subject to inspection and approval by the Engineer.

3.2 LIMITATIONS

- A. Complete all work between May 15 and August 31.
- B. Do not place chip seal coat if surface moisture is present.
- C. Place seal coat when:
 - 1. Pavement temperature is between 70 and 136 degrees F.
 - 2. Air temperature is between 50 and 110 degrees F.
 - 3. Forecasted temperature is not expected to be below 40 degrees F within 3 days after placement.
- D. Do not apply any bituminous asphalt after 6:00 p.m. if temperatures in this Section, article 3.2 paragraph C can not be maintained throughout all night time hours.
- E. On interstate routes, do not open to traffic the same day chip seal coat is placed.
 - 1. Sweep and open to traffic no earlier than 14 hours after placing cover material.
- F. Apply bituminous flush coat material after receiving approval from the Engineer, but no earlier than 48 hours after application of the cover material.
 - 1. Apply bituminous flush coat material when the air temperature in the shade is 50 degrees F and rising, and the pavement temperature is 70 degrees F and rising.
 - 2. Do not apply bituminous flush coat material during fog, rain, or other adverse conditions.

3.3 COVER MATERIAL STOCKPILE

- A. Construct on a clean base to minimize contamination.
- B. Construct to facilitate uniform dampening. Avoid excess moisture.

3.4 TEMPORARY PAVEMENT MARKER APPLICATION

- A. Refer to Section 01558.

3.5 ASPHALT MATERIAL /COVER MATERIAL APPLICATION

- A. Apply asphalt material at a rate sufficient to obtain 50 percent chip embedment before the rolling operation, and 70 percent chip embedment after rolling operation.
 - 1. Adjust application rates throughout the project depending on existing conditions.
- B. Apply the asphalt emulsion at a minimum temperature of 145 degrees F.
- C. Do not apply asphalt material if any of the following conditions apply:
 - 1. Material does not meet the required viscosity.
 - 2. Material does not spray through the distributor in a uniform way and remain in place on the roadway.
- D. Place building paper adjacent to the transverse construction joint before starting each spraying operation.
 - 1. Maintain the control valve to act instantaneously, both at start-up and cut-off.
- E. Locate longitudinal joints within 6 inches of the traffic lane line location.
 - 1. Construct meet lines with no skip or voids between adjacent passes.
 - 2. Do not place a double thickness of cover material.
- F. Calibrate the spreader at the beginning of each day and as often as necessary to comply with Table 4.
 - 1. Maintain a distance of less than 150 ft between the distributor and the chip spreader.
 - 2. Maintain the chip spreader speed such that chips do not bounce or roll upon application.

Table 4

Approximate Spread Rates	
Unit Weight lbs/ft³	Application Rate lbs/yd²
60 - 65	17.0
65 - 70	18.4
70 - 75	19.8
75 - 80	20.7
80 - 85	22.1
85 - 90	23.5
90 - 95	24.9
95 - 100	25.8

3.6 SURFACE ROLLING

- A. Use a minimum of three pneumatic-tire rollers in a longitudinal direction to roll surface after the cover material has been spread.
- B. Roll a minimum of three passes to seat the cover material.
 - 1. A pass is defined as traveling in one direction only.
- C. Control bleeding with blotter material and as directed by the Engineer.
- D. Set the roller speed to prevent bouncing or skidding, not to exceed 5 mph.
 - 1. Reduce roller speeds during directional changes to prevent tearing of the surface.
 - 2. Repair all damage done to the seal coat by the rollers.
- E. Synchronize the speed of the distributor and chip spreader with that of the rolling operation.
 - 1. Begin initial rolling, consisting of one complete coverage, immediately behind the chip spreader.
 - 2. Begin secondary rolling, consisting of second and third coverage, immediately after completing initial rolling.
 - 3. Synchronize all operations to keep rolling operations within 2500 feet of the ongoing chip seal application.
- F. Sweep excess cover material off the roadway after the emulsion has set.
 - 1. Remove excess cover material to the satisfaction of the Engineer before opening the roadway to traffic.

3.7 BITUMINOUS FLUSH COAT APPLICATION

- A. Clean the surface of all dirt, sand, dust, loose chips, and other objectionable material to the satisfaction of the Engineer before applying bituminous flush coat.
- B. Apply the bituminous flush coat at a rate of $0.11, \pm 0.01$ gal/yd².
 - 1. Keep traffic off the flushed surface until the bituminous material has set sufficiently to prevent tracking or pick-up.
 - 2. Allow a minimum of 24 hours before applying permanent application of traffic striping or markings after completing flush seal.

3.8 TRAFFIC CONTROL

- A. Refer to Section 01554.

END OF SECTION